REMARKS

Withdrawn method claim 15 includes all of the limitations of product claim 1. Therefore, method claim 15 is eligible for rejoinder pursuant to MPEP § 821.04 (upon allowance of claim 1), and there is no need to cancel claim 15. This is discussed in MPEP § 821.01, bridging the left- and right-hand columns at page 800-63 (REV. 5, Aug. 2006). Form paragraph 8.24 (paragraph 2) as set forth at page 2 of the Office Action pertains to the situation where the Examiner is preparing a final Action and there has been a traversal of a requirement for restriction, and is not applicable here.

New claims 21 and 22 further characterize the wiring board of claims 1 and 2, respectively, to recite that the SiO_2 particle has a hydrophilic surface (support bridging pages 7-8 of the substitute specification); the coated ceramic green sheet is exposed to a wet nitrogen atmosphere at 650 to 900°C so as to remove organic components (support at pages 7, 20 and 36 of the substitute specification); the coated ceramic green sheet is fired at 850 to 1050°C after exposing to the wet nitrogen atmosphere (support at page 20 of the substitute specification; and the conductor layer has a resistivity of 3.2×10^{-6} Ω·cm or less (support at page 19 of the substitute specification).

Review and reconsideration on the merits are requested.

Claims 8, 9, 19 and 20 were rejected under 35 U.S.C. § 112, second paragraph. The Examiner considered the rejected claims to be indefinite as to the scope of the claimed "inorganic material."

The Examiner further considered that the rejected claims (which allow for inorganic particles having a size of up to two or three μm) to be inconsistent with the claims from which they depend which also call for an SiO_2 particle (i.e., also an inorganic material) having an

average particle size of 40 nm or less (now 30 nm or less) and a ceramic particle selected from Al_2O_3, TiO_2, CeO_2 and mullite (i.e., also an inorganic material) having an average particle size of 100 nm or less.

Applicants respond as follows.

The specification bridging pages 13-14 (see substitute specification) defines "inorganic material" as being (i) a ceramic particle non-vitrifiable after sintering, (ii) an inorganic component diffused from the insulating layer, (iii) a vitreous ceramic particle or a ceramic particle vitrifiable after sintering, or (iv) an aggregate thereof.

Claim 8 has been amended to more clearly recite that a total area of inorganic material having a particle size of 2 μm or more is 5% or less of the sectional area of the fired conductor layer. Claims 9, 19 and 20 have been similarly amended. Support is found, for example, at page 17, line 18 - page 18, line 9; at page 18, line 16 - page 19, line 7; at page 37, line 15 - page 38, line 5; and at page 40, line 22 - page 42, line 7. Specifically, it is the sectional area of the fired conductor layer that is measured (i.e., in Embodiment 4, the wiring board of Example 2-G which had been fired as described bridging pages 37-38 was cut, the cut face was polished, and the cross section of the conductor layer was observed SEM as describing pages 40-41 of the specification).

Further, claims 8 and 9 have been amended to correct an inadvertent error, so as to refer to the total area of inorganic material excluding metal.

Claims 1 and 2 are open-ended. Therefore, the copper paste (and resulting fired conductor layer) may contain inorganic material (other than an SiO_2 particle and a ceramic particle selected from Al_2O_3, TiO_2, CeO_2 and mullite) having a larger particle size of up to 2 or 3 μm. For example, the fired conductor might contain MgO particles having a larger particle size

(as further limited by claims 8, 9, 19 and 20), as long as the copper paste contains an SiO_2 particle having an average particle size of 30 nm or less and a ceramic particle having an average particle size of 100 nm or less selected from Al_2O_3, TiO_2, CeO_2 and mullite. Thus, there is no contradiction among the various claims.

It is respectfully submitted that the claims as amended fully comply with 35 U.S.C. § 112, and withdrawal of the foregoing rejection is respectfully requested.

Claims 1, 2, 4-10 and 16-20 were rejected under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over U.S. Patent 5,296,189 to Kang et al. The grounds for rejection remain substantially the same as set forth in the previous Office Action.

Applicants respond as follows.

Kang et al discloses copper paste containing alumina particles having a starting size of about 0.05 to about 0.1 μm for controlling grain growth by retarding sintering, and discloses examples of other retardants including silica. The Rule 132 Declaration of Kazuyuki Fujii dated August 29, 2008 establishes (i) that SiO_2 and alumina do not have the same function and are not so easily substituted in a copper paste for a wiring board; and (ii) criticality in an SiO_2 particle having an average particle size of 30 mm or less for providing the effects of the invention.[1] As to (i) above, undeniably, the wiring board of Example 1-D prepared using a copper paste containing, as an additive, a SiO_2 particle having an average particle size of 12 nm had a waiving

[1] Bridging pages 2-3, the Declaration under 37 C.F.R. § 1.132 dated August 29, 2008 describes that Comparative Example 2-A was prepared using a copper paste containing, as an additive, an Al_2O_3 particle having an average particle size of 30 nm in place of the SiO_2 particle. Correctly, Comparative Example 2-A was prepared using a copper paste containing, as an additive, an Al_2O_3 particle having an average particle size of 13 nm in place of the SiO_2 particle as shown in the Table. A corrected Declaration is submitted herewith.

amount and resistivity remarkably lower than that of Example 2-A prepared using a copper paste containing, as an additive, an Al_2O_3 particle having an average particle size of 13 nm instead of the SiO_2 particle. Even if Kang et al suggests that other retardants including silica may be used, Kang et al identified alumina particles as the best mode for practicing their invention and did not recognize the advantageous effect of including SiO_2 particles having a very small average particle size. In other words, any suggestion of obviousness is more than outweighed by the unexpectedly superior results of the invention as shown in the test data presented in Applicants' Rule 132 Declaration.

So as to further distinguish the invention from Kang et al, which discloses a copper paste containing alumina particles having a starting size of from about 0.05 to about 0.1 μm, claims 1 and 2 have been amended to limit the SiO_2 particle to one having an average particle size of 30 nm or less (support at page 7, lines 18-22 of the specification).

Because the claims allow for the presence of inorganic material having a much larger particle size, the Examiner additionally considered that "a slightly larger SiO_2 or Al_2O_3, that is 50-100 nm, would have no detrimental effect."

Applicants respond as follows.

The present claims are open-ended and do not exclude ceramic particles having a slightly larger particle size of 50-100 nm. Further, the presence of such slightly larger particles may well have no detrimental effect. However, that is besides the point. Claims 1 and 2 require a copper paste containing an SiO_2 particle having an average particle size of 30 nm or less, which limitation is not met by the cited prior art. The presence of the small-sized SiO_2 particle provides a wiring board having a remarkably reduced waiving amount and resistivity as demonstrated in the Table at page 2 of the Rule 132 Declaration. This effect of the invention is not obtained by

the Additional Example prepared using a copper paste containing an SiO_2 particle having an average particle size of 80 nm, which Additional Example is closer to the invention then Kang et al which employs alumina particles "having a slightly larger particle size that is 50-100 nm."

The data Table from the Rule 132 Declaration is reproduced below.

Table

		Particle Size of Cu	Additive (1)			Additive (2)			Waving Amount (mm)	Resistivity (μΩ·cm)
			Additive	Particle Size of Additive (nm)	Amount of Additive Added (parts by mass)	Additive	Particle Size of Additive (nm)	Amount of Additive Added (parts by mass)		
Example	1-D	4.7	SiO_2	12	1.0	none	-	-	-0.01	2.5
	2-A	4.7	Al_2O_3	13	1.0	none	-	-	1.02	4.4
	1-J	4.7	SiO_2	30	1.0	none	-	-	0.02	2.5
	Additional Example	4.7	SiO_2	80	1.0	none	-	-	-0.05	4.8

Because Kang et al does not disclose a wiring board prepared from copper paste containing an SiO_2 particle having an average particle size of 30 nm or less, the present claims are not anticipated by Kang et al. Further, in view of the test data presented in the Rule 132 Declaration showing (i) that SiO_2 and alumina do not have the same function and are not so easily substituted in a copper paste for a wiring board; and ii) criticality in an SiO_2 particle having an average particle size of 30 nm or less for providing the effects of the invention, it is respectfully submitted that the present claims are also patentable over Kang et al. As shown by the Additional Example of the Declaration, even if the slightly larger Al_2O_3 particle of Kang et al is substituted with an SiO_2 particle having an average particle size of 80 nm, the remarkable results of the invention are not fully obtained. Further, the fact that the claims are open-ended and allow for ceramic particles having a larger size is not relevant. This is because the claims

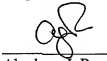
require an SiO_2 particle having an average particle size of 30 nm or less, which limitation is not met by Kang et al.

Withdrawal of all rejections, rejoinder of withdrawn method claim 15 and allowance of claims 1, 2, 4-10 and 15-20 is earnestly solicited.

In the event that the Examiner believes that it may be helpful to advance the prosecution of this application, the Examiner is invited to contact the undersigned at the local Washington, D.C. telephone number indicated below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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